# Introduction to Operating System

An Operating System (OS) is an interface between computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

Some popular Operating Systems include Linux Operating System, Windows Operating System, VMS, OS/400, AIX, z/OS, etc.

Definition

An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.
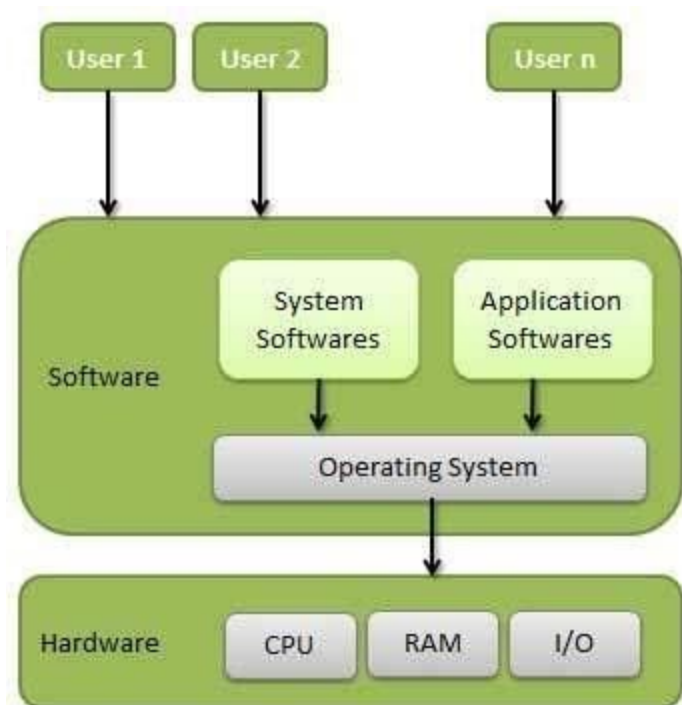
Functions of OS:-

Following are some of important functions of an operating System.

- Memory Management
- Processor Management
- Device Management
- File Management
- Security
- Control over system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users

Memory Management

Memory management refers to management of Primary Memory or Main Memory. Main memory is a large array of words or bytes where each word or byte has its own address.

Main memory provides a fast storage that can be accessed directly by the CPU. For a program to be executed, it must in the main memory. An Operating System does the following activities for memory management −

- Keeps tracks of primary memory, i.e., what part of it are in use by whom, what part are not in use.
- In multiprogramming, the OS decides which process will get memory when and how much.
- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated.

Processor Management

In multiprogramming environment, the OS decides which process gets the processor when and for how much time. This function is called **process scheduling**. An Operating System does the following activities for processor management −

- Keeps tracks of processor and status of process. The program responsible for this task is known as **traffic controller**.
- Allocates the processor (CPU) to a process.
- De-allocates processor when a process is no longer required.

Device Management

An Operating System manages device communication via their respective drivers. It does the following activities for device management −

- Keeps tracks of all devices. Program responsible for this task is known as the **I/O controller**.
- Decides which process gets the device when and for how much time.
- Allocates the device in the efficient way.
- De-allocates devices.

File Management

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.

An Operating System does the following activities for file management −

- Keeps track of information, location, uses, status etc. The collective facilities are often known as **file system**.
- Decides who gets the resources.
- Allocates the resources.
- De-allocates the resources.

Other Important Activities

Following are some of the important activities that an Operating System performs −

- **Security** − By means of password and similar other techniques, it prevents unauthorized access to programs and data.

- **Control over system performance** − Recording delays between request for a service and response from the system.

- **Job accounting** − Keeping track of time and resources used by various jobs and users.

- **Error detecting aids** − Production of dumps, traces, error messages, and other debugging and error detecting aids.

- **Coordination between other softwares and users** − Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

Without an operating system, every program will need a means to handle all computer components and hardware. This means that it will need a method to accept user inputs using keyboards and mice, to print documents, to read and write on storage devices, to keep track of time, to send output to the screen and even to communicate across a network. This would cause every single program to be very extensive and heavy.

TYPES OF OPERATING SYSTEMS

Since the very first operating system was made, operating systems have kept evolving with time to accommodate more and more sophisticated tasks. Let's take a look at some of the most common types of operating systems in use today.

Batch Operating System

In this operating system, the user will prepare the job and hand it to a computer operator in form of a device like a punch card. The computer operator would then group the jobs according to their computing requirements and execute them in batches to ensure a faster processing speed. It's best suited for programs that require long computation times and no user involvement such as statistical analysis of large chunks of data.

Some of the problems associated with these operating systems include the lack of interaction between the user and the computing job, the difficulty of prioritizing tasks based on their urgency, high turnaround times and the high CPU idle time caused by the low speed of the mechanical input and output devices.

Multiprogramming Operating System

Like the name suggests, a multiprogramming operating system is an operating system that is capable of running multiple programs at the same time. The main aim in multiprogramming operating systems is to improve resource utilization and system throughput. This is achieved by organizing the computing jobs in a manner that ensures that the CPU always has a job to execute at any one time.

These operating systems are sometimes referred to as multitasking operating systems because they allow two or more processes to run simultaneously. This is to mean that data from two or more processes can be held in the primary memory at a given time.

Time Sharing Operating System

This is a unique type of multiprogramming operating system. Like the typical multiprogramming operating system, it allows multiple tasks to run concurrently. However, this is unique in that it has been designed to

accommodate multiple users. This means that multiple users can use the same computer resources. The best part about this operating system is that these users will not need to queue to access these resources.

Each of these users gets the impression that she is using her own computer despite the fact that it is just one computer that is being shared among a number of users. This is thanks to frequent switching of jobs by the CPU which ensures fast response times.

This operating system ensures that CPU idle time is kept at a minimum while at the same time avoiding duplication of software. However, data communication can be a problem when multiple users are accessing or updating the same programs and data. As a result, reliability can be a problem.

Distributed Operating Systems

The distinguishing feature of distributed operating systems is the fact that they have multiple central processors. These processors are used to serve a number of users running a number of real-time applications. In other words, these operating systems pull together groups of distinct computers and make them function as one single computer.

These operating systems came into use when computer networks were developed to allow standalone computers to communicate with each other. This enabled resource sharing and dramatically increased data exchange between sites. Distributed operating systems also ensure that there is a lighter load on the host machine even when performing heavy computation.

Network Operating System

Like the name suggests, this operating system runs on a server and it allows computers on a network to access the computing resources. The management of the users, data, applications and security is done on the server.

This operating system allows file and printer sharing between computers in a network. This operating system provides more security and stability of the system. However, the costs associated with buying and running a server can tend to be quite high for small businesses.

Real-Time Operating Systems

In these operating systems, it is vital that inputs are received and processed in an extremely short period of time. As a result, the operating system has to guarantee that the events will be processed in a given time. Some of these systems might allow multi-tasking, but with special algorithms for scheduling to ensure that switching of tasks takes place according to their priorities so that the deadlines are met for every task.

Examples of uses for real-time operating systems include air traffic control systems, medical imaging systems, weapon control systems, industrial control systems and scientific experiments.

There are two types of real-time operating systems. The first one is referred to as *hard real-time operating systems* and this type will guarantee that the critical operations will be completed in a given time. The other type is known as *soft real-time operating system* and it gives priority to a given task without the guarantee that it will be completed in a fixed amount of time. However, the critical task will be completed before any other task.

TOP FIVE OPERATING SYSTEMS

There are many operating systems in use today. Different tech giants have made operating systems for their customers and each of them comes with its own fair share of benefits and disadvantages when put into different uses.

As a result, some of them are more popular than others. Let's take a look at five of the most popular computer and smartphone operating systems.

1. COMPUTER OPERATING SYSTEMS

Each computer operating system has its own loyal fan base that would swear that no other operating system is good enough. However, the following five were rated consistently high when it comes to market share in computers.

Windows

A good percentage of computer users have interacted with the Windows operating system at some point. Windows operating systems are built by Microsoft. Currently, more than 350 million devices are running on Windows 10, and the company hopes to get this number to 1 billion by 2018. By 2011, more than 1.25 billion computers were running on a version of the Windows operating system globally.

This does not come as a surprise considering the fact that until recently, Windows operating systems have had a market share of above 90%. Windows 7 is still quite popular, but its use is declining thanks to the increased popularity of Windows 10.

At the moment, the latest Windows operating system is Windows 10. Older editions include Windows 8.1, Windows 8, Windows 7,Windows Vista, Windows XP and Windows 2000. The popularity of Windows operating systems can be partly attributed to the success of the Microsoft Office Suite that currently has over 1.2 billion active users. It is available in 140 countries and in 107 languages.

Windows devices offer the widest compatibility with hardware and software and they range from cheap entry level devices costing a few hundred dollars to expensive high performance gaming machines.

These operating systems are not without downsides. Windows computers have not been built with the attention to detail you would find in a Mac. An example of this is seen in the build quality of the hardware such as the trackpads and the screen, which is superior in Macs.

Another downside is in the large number of malware. Thanks to their popularity, Windows computers are a favorite for crooks hence most malware is written for the platform. This means that you are more vulnerable using a Windows computer when compared to other operating systems.

Mac OS

This operating system has been developed by Apple Inc. for Apple computers. It comes preinstalled on all Macintosh computers. Mac OS was the original operating system for Macs that was replaced by the current Mac OS X. Mac OS had been Apple's primary OS from 1984 all the way to 1999 when Apple released Mac OS X Server 1.0 that was designed for server use.

Not long after that, Apple released a desktop version of OS X that shipped with Macs from 2001. Until the release of OS X 10.7 also known as "Lion", Apple had been producing distinct server and client editions of OS X. These two editions were merged in OS X 10.7 and all later editions.

One unique feature about Mac OS and OS X is that it is clear and very specific. It has been built as a desktop operating system and it does just that. With that in mind, none of the problems that were caused by Windows 8's "Metro" interface are bound to happen.

The interface has been well designed and as a result, it's hard not to like this OS. A lot of thought has also gone in the design of the computers hence it's hard not to enjoy using them. They come with excellent battery life, an easy to use touchpad and generally above average hardware capabilities. Modern MacBooks will easily outshine even the high-end ultrabooks for average users.

However, this OS also has its downsides. The first one is the most obvious one: cost. Since the OS only runs on Apple computers, you will have to purchase one to use the OS. Unfortunately, these computers are not available in the low or mid-range budget. If your budget is below $500, then forget about owning a Mac unless you are open to owning a pre-owned refurbished one that may or may not work as expected.

Another downside is in the software. Although a majority of the necessary office and professional creative applications like the Microsoft Office Suite and Adobe Creative Suite are available on this platform, it is still incomparable to the millions of software available for Windows users. Luckily, with the increasing popularity of web-based software, this OS is getting more and more functional when compared with older versions. You will however have to compromise when it comes to games because this platform is still very far behind.

Linux

Linux is an operating system designed for the tech savvy users who know their way around computer software and hardware. Linux laptops are available from a number of vendors, but if you like you can download a free copy of the OS and install it in another computer. However, if you choose to do the installation yourself, there is no guarantee that all your hardware will work as expected.

Linus operating systems are popular among developers and Geeks who prefer a UNIX based operating system.Like in Macs, the adoption of web-based software has really helped make Linux more usable and functional to the average users, it's still very hard to recommend a computer running on this platform to someone who isn't particularly looking for the Linux platform.

Chrome OS

Like the name suggests, this operating system relies heavily on Google's Chrome web browser. It is the operating system that comes in all Chromebooks and although it has a number of desktop applications, a big chunk of the work happens in the Chrome browser.

This means that if you want to extend functionality, you will have to find a Chrome app for whatever it is that you want to do. You will not be able to run Windows or Mac desktop software on this platform, but that should not be a problem because there are thousands of Chrome apps that should enable you to do almost anything that you would like to do.If you would like to run Linux desktop software, you will have to switch your Chrome book to developer mode first.

Despite these challenges, there are benefits. One of them is the fact that Chromebooks are very cheap. You can get a good one between $200 and $300 and they are very easy to use. You will also get the benefit of not having to worry about malware like in the case of Windows computers.

This OS is the ideal choice if all your work can be done on the Chrome browser. You will get a simple interface without having to break the bank.

Android

Although Android is more popularly known as a smartphone operating system, let's mention it here because of the many convertible tablets. A good example is the Asus Transformer devices that function as tablets, but once you add the keyboard, they can be classified as complete Android computers.

Despite the fact that Android is a very powerful smartphone operating system, most people will not like using it for computing. The user experience as a laptop is not exactly what most people are looking for in a computer. For starters, you will be limited to using mobile apps which means that you will not get windowed desktop apps. The browser is also a mobile app which is not as easy to use as a desktop browser.

Nonetheless, if you are looking for flexibility and mobility, then this will work for you. The keyboard will make typing easier and faster as compared to typing on your tablet screen.

2. SMARTPHONE OPERATING SYSTEMS

Like in computers, smartphone operating systems also have their own loyal fans who would give you dozens of reasons why their OS is the best. Let's take a look at five of the most popular operating systems in the smartphone world today.

Google Android

The Android smartphone operating system is made by Google and is based on the Linux kernel. With a market share of more than 80% globally, Android is easily the most popular mobile operating system in the world. Despite its lack of popularity in the computing world, it is a favorite for many in the smartphone market. It is easy to use and gives users limitless possibilities when it comes to customization.

Another reason behind the popularity of the Android operating system is the large number of app developers. This ensures that users always have a solution for whatever problem they have in form of an app. The platform has minimum restrictions, hence developers can achieve much more with applications. This explains the millions of apps on the Android Play Store available to users.

The fact that this operating system is available to numerous smartphone manufacturers has further increased its popularity globally. This also makes it available to more people, because even those with lower budgets will be able to find Android devices to buy.

Apple iOS

This operating system comes preloaded on all iPhones made by Apple Inc. Just like it is with Mac OS, the operating system is not available on devices from other manufacturers. What this means is that the company is

able to keep track of the quality of the devices that are released to the market, which means that quality is significantly higher.

This operating system is a multi-tasking operating system that runs on the iPad, iPhone, Apple TV and the iPod. It has the second largest user base worldwide on smartphones. When it comes to applications, users of the iOS have access to millions of applications from the Apple App Store. This community also has a good number of developers who are constantly adding apps to the ones already on the store.

The main challenge facing this operating system is the same challenge facing the Mac OS. Since the OS is available only on Apple devices, you will have to own one to user it. Unfortunately, the company seems to only target the high-end market, which means that users with a low budget will not be able to afford these devices.

Windows Mobile

Previously referred to as Windows Phone, Windows Mobile is the third operating system on the list of most popular mobile operating systems.It is made by Microsoft and so far it has had six versions released. Since it was released in February 2010, this operating system has used an interface similar to the Windows 8 Metro.

Despite the popularity of the Windows OS in computers, Microsoft has not seen as much success in the smartphone world. A big chunk of users (even those using Windows computers) still prefer to use Android or iOS.

Some of the main advantages of this operating system include ease of operation and a visually appealing animated interface. It also doesn't eat up a lot of RAM which means that heavy applications can run smoothly on this operating system.

One big downside to this OS is the relatively low number of applications on the Windows Store when compared to the Android Play Store and the Apple App Store. Developers have not warmed up to this platform as much as they have on the other two app stores. However, this number is growing steadily and users still have access to a reasonable number of applications.

Blackberry OS

This OS is owned by RIM (Research In Motion), the makers of Blackberry smartphones. This was one of the earliest smartphone operating systems, but it was quickly overtaken by Windows Mobile, Android and iOS. Despite this, it is still very dominant in the global market with a good number of early adopters still choosing to stick with it.

This operating system has seen its [fair share of challenges](#) in the past two decades. Nonetheless, it is still among the top 5 most popular smartphone operating systems in the market. It is a favorite for business applications, explaining how it has been able to stay in operation despite the stiff competition from Apple and Android.

Many current users of this operating system are the loyal fans from the time when it was one of the most dominant smartphone platforms in the world.

Firefox OS

Firefox OS is an open source operating system from Mozilla, the name behind the popular Firefox browser. The main motivation behind the development of this operating system is a [desire](#) by the company to make the open web more competitive and give the single vendors a run for their money.

COMPONENTS OF AN OPERATING SYSTEM

The different components of an operating system enable it to perform its duty of enabling the different parts of a computer to work together. Let's take a look at what each of these components does.

1. *Kernel.* The kernel forms part of the building blocks to the work of an operating system. It helps in managing the hardware devices in the computer by determining the hardware resources that will get access to different programs. By doing this, it ensures that the CPU is operating optimally at all times.

2. *Process Management.* There are very many programs running on a computer at any one time. From background applications to the programs that users are actively interacting with, there are hundreds of processes taking place in a computer during normal use. Since all modern operating systems allow multi-tasking, it is the operating system's duty to distribute the available resources among all the active processes.

3. *Memory Management.* There are several types on memory on a modern computer. They include CPU cache, RAM and disk storage. The operating system has a memory manager that tracks the amount of each memory that's available and manages the movement of data between them. This ensures that the highest amount of available memory for each process so as to increase speed of execution. The operating system also ensures that whenever two or more processes are in memory at the same time, virtual memory addresses are allocated to each process to ensure that no process interferes with another's memory.

4. *Security.* Since the operating system is in charge of directly or indirectly controlling computing resources, it should be able to distinguish between the requests that should be allowed and those that shouldn't. This includes internal requests from within the computer as well as external requests from other computers within the network. They also offer auditing options to tell the users that have accessed different files and any changes that may have been made.

5. *Networking.* Networking basically enables operating systems to share resources using different types of connections. The most common networking protocol is the TCP/IP protocol.

6. *File Systems and Disk Access.* Controlling access to data stored on the different disks in computers is a primary feature of operating systems. The operating system ensures that files are stored in a manner that allows quick access and the highest possible reliability. In addition, they also help make good use of the available space on the disk. The file system is the manner in which files are stored on a disk. It gives names and attributes to files and also ensures that the files are arranged neatly in directories.

CHOOSING AN OPERATING SYSTEM FOR YOUR BUSINESS

Now that we have established that each operating system has its own strengths and weaknesses, let's go over how to choose the best one for your business.

- *Ease of use.* Think about the user interface offered by the different operating systems. Every one of them will have a learning curve, but this learning curve will not be the same for all users. Think about your staff's background. Which operating system are a majority of them familiar with? Pick the one that will be the easiest for your staff to work with. This will ensure a smooth experience for your customers.

- *Availability of software and applications.* Next, you need to be sure that you will have access to the software that you use in service delivery. Windows will generally have the widest range of options when it comes to software, but that's not the point of choosing an operating system. You don't need the millions of programs that are

available. You just need those that help you in delivering your services. Pick the operating system that has everything that you need with full support and updates.

- *Note what your customers use.* To avoid compatibility problems when you have to send or receive files to and from your customers, it's important to think about the operating system that is most popular among your customers. This will ensure that you have no problems connecting with them as you give your services.

- *Security.* While considering security, you will have to think of how tech savvy your staff is. If a majority of them are new computer users, then you will need to invest in a very secure operating system. Windows is by far the most vulnerable. However, if you train your personnel in safe browsing habits, you might be able to avoid most of these attacks.

- *Cost.* Finally, you will need to ensure that the computers are within your budget. If you are stocking computers for the entire company, ensure that you can afford them. Macs generally cost more than most of the others and with Windows you will have a wider range to pick from. However, Windows is less secure than Mac.